Space Weather Technical Forecast

Issued on Friday, 25 February 2022 at 01:15 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: No significant activity expected.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Solar activity is very low with two active regions, AR2954 (Hsx/Alpha) and AR2955 (Cso/Beta) on the visible disc, but no significant flares. No Earth-directed CMEs were observed in the available imagery during the past 24 hours.

Solar Wind / Geomagnetic Activity: The solar wind, as measured by DSCOVR at L1, has followed a steadily declining trend from 550km/s to 400km/s, as the effects of coronal hole 56 wane. Density has been around or below average. Total magnetic field strength (IMF) has been weak, with the north-south component, Bz varying weakly between +6nT and -6nT. Phi angle has been mainly positive (away from the Sun), with brief rotations into the negative orientation. Resultant geomagnetic activity was Quiet (Kp 0-2).

Energetic Particles / Solar Radiation: The high energy proton flux (10MeV) measured at GOES 16 was at background levels. The high energy electron flux (greater than 2MeV) has been at normal background to moderate levels. The corresponding 24-hour integrated electron fluence is well below the Active (1e8 integrated pfu) threshold with the 25/0000 UTC observation at 2.74e7 integrated pfu.

Four-Day Space Weather Forecast Summary
Solar Activity: Solar activity is forecast to be mainly very low, occasionally low, with a very slight risk of M-class flares.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs are forecast. Three coronal hole high speed stream connections are expected through the next three days, with winds likely to be between 400-500km/s. Geomagnetic activity is expected to be generally Quiet with Unsettled spells. There is a chance of Active and a very slight chance G1/Minor Storms, mainly on days 2 and 3 (26 and 27 February).

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux is expected to remain at background levels. High energy electron flux is likely to follow a rising trend, with an increasing likelihood through the period of exceeding the high (1e3pfu) threshold on diurnal peaks. Electron fluence is forecast to follow a rising trend.

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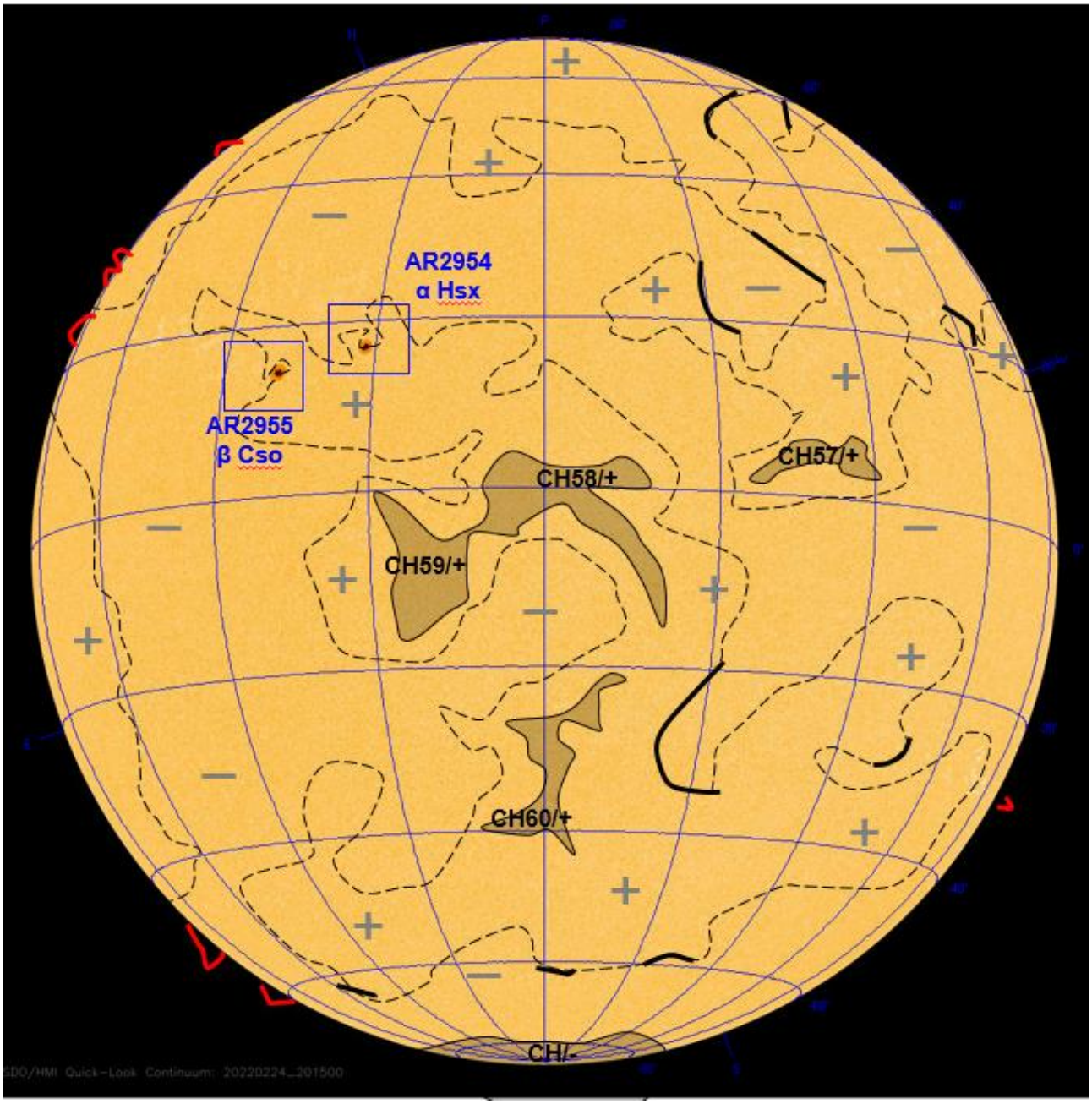
Figure 1. Solar Analysis Valid 24/2000UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

There are no Earth-directed CMEs forecast.

The high speed stream from coronal hole 57 is expected to connect with Earth on 25 February (day 1), followed by a connection with coronal hole 58 on 26 February. A connection with coronal hole 59 is then forecast on 27 February. Solar wind speeds from these holes are likely to be in the range 400-500km/s, with coronal hole 59 likely to produce the strongest winds and geomagnetic activity.

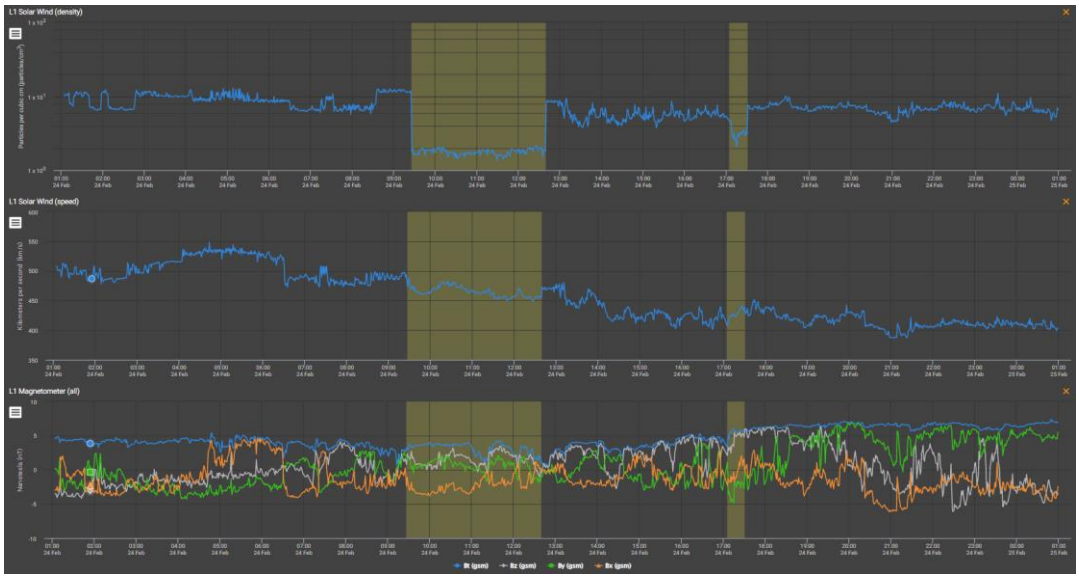
Geomagnetic activity is expected to be Quiet with isolated Unsettled intervals. Active periods are possible, with a slight chance of G1/Minor Storm intervals due to the coronal hole effect, especially on days 2 and 3 (26 and 27 February).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	10	10	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity – Earthbound Coronal Mass Ejections

None expected

Figure 2: Recent solar wind observations.



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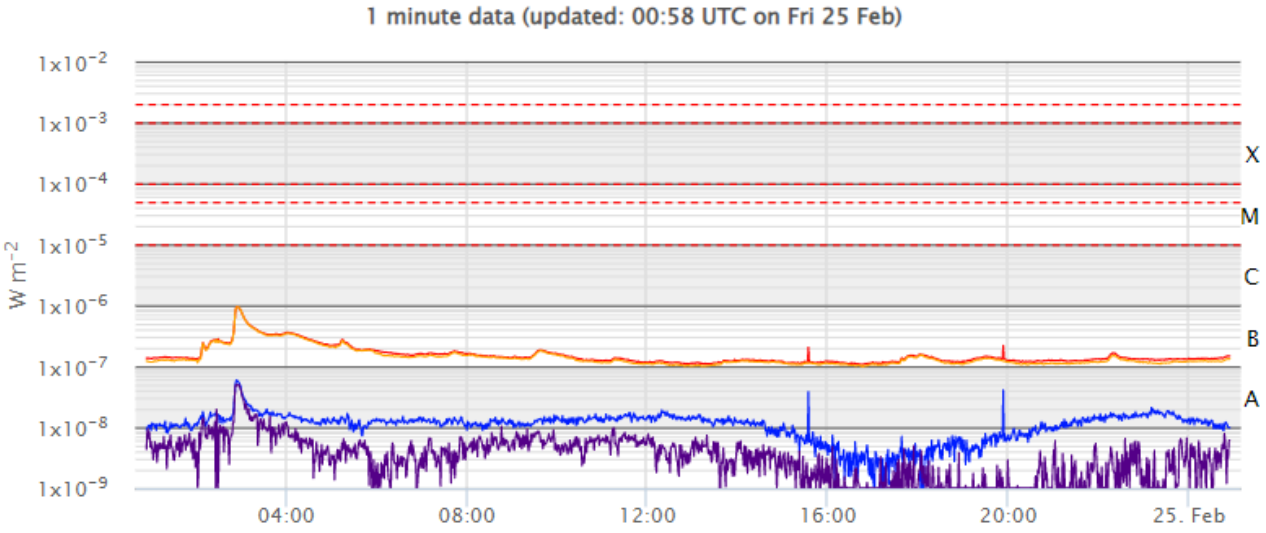
Radio Blackouts - X-Ray Flares:
Solar activity is very low, with two mature and apparently stable sunspots on the visible disc. Further active regions are expected to rotate onto the visible disc in the next four days, with analysis of farside imagery suggesting that these could present a low risk of M-class flares.

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	5	5	5	5
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3: GOES 16 X-ray flux



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Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (10MeV) measured at GOES 16 is at background levels, and expected to remain at this level with no solar radiation storms occurring.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

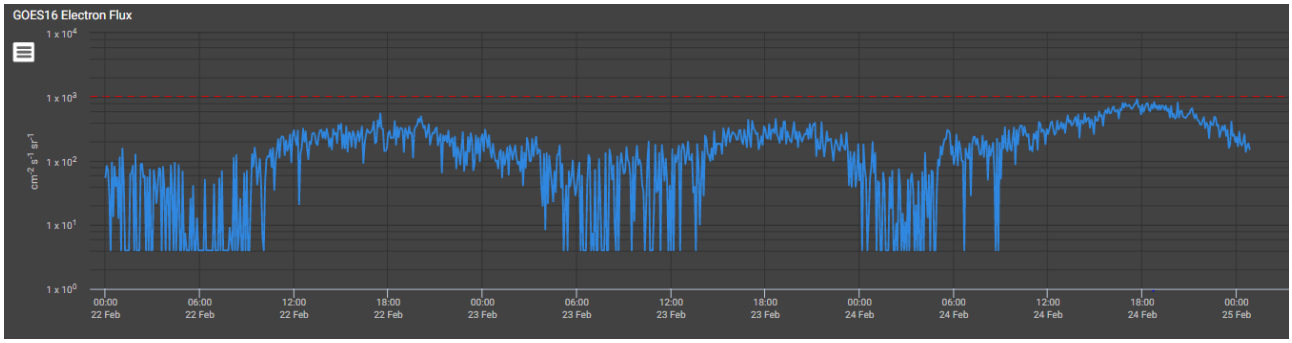
High Energy Electrons Event (≥ 2MeV):

High energy electron flux (greater than 2MeV) has varied between moderate and high levels, with an increasing trend in the diurnal peak. High (1e3pfu) levels are increasingly likely due to the elevated solar winds speeds, but could be inhibited by geomagnetic enhancements.

Associated electron fluence is expected to rise due to the electron flux enhancements, but is likely to stay below the Active (1e8 integrated pfu) threshold.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	10	20	20	20
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 4: GOES 16 electron flux for last three days, showing an increasing trend in the diurnal peak.



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